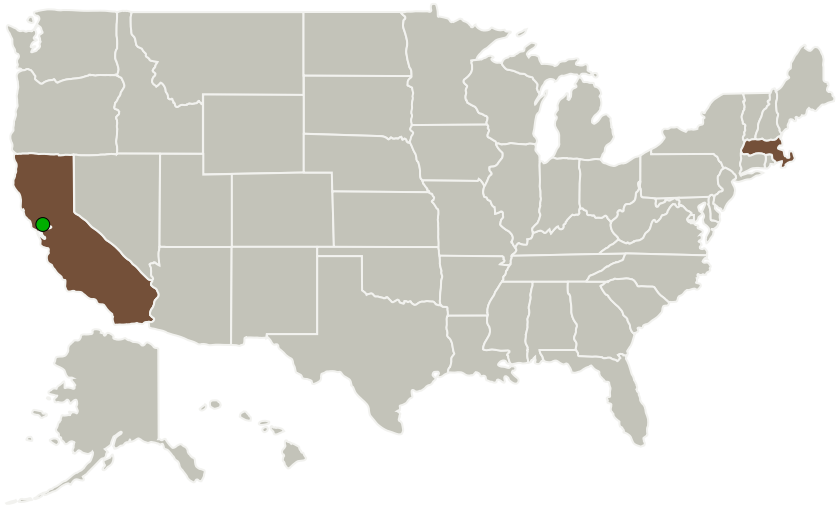
Stochastic Robotic Simulation Tool, Phase I

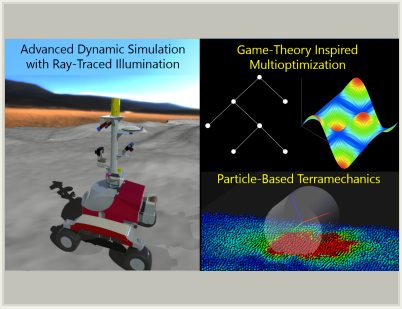
Completed Technology Project (2015 - 2015)

Project Introduction

Energid Technologies proposes a game-theory inspired simulation tool for testing and validating robotic lunar and planetary missions. It applies Monte Carlo simulation within a multi-optimization environment tailored to the needs of NASA. Stochastic optimization is combined with randomized simulation to maximize multiple statistical measures of performance and calculate the parameters giving the extreme scenarios. The tool works with continuous parameters, such as mass and terrain properties, and with discrete parameters, such as lighting selection, gearing selection, and navigation parameters. It includes accurate modeling of sensors and terrain interaction using calculations performed on Graphical Processing Units (GPUs). The technique proposed is computationally expensive, but highly parallelizable, and the approach includes a design for distribution of computational burden over multiple computers, GPUs, clusters, and cloud configurations. The proposed combination of fast algorithms and game-theory-inspired statistical optimization will provide a powerful tool for NASA's use in planning missions.

Primary U.S. Work Locations and Key Partners





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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Energid Technologies	Lead Organization	Industry	Cambridge, Massachusetts
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

June 2015: Project Start

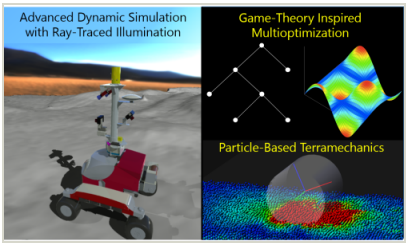
December 2015: Closed out

Closeout Summary: Stochastic Robotic Simulation Tool, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/140510)*

Images



Briefing Chart Image
Stochastic Robotic Simulation Tool, Phase I
(https://techport.nasa.gov/image/135808)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Energid Technologies

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

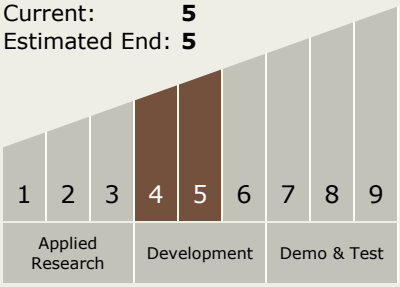
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Ryan Penning

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.6 Robotics Integration
    - TX04.6.2 Modeling and Simulation for Robots

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System